REMARKS

Claims 13, 32, 39 and 59 have been amended, and claim 69 has been added. Accordingly, upon entry of the above amendments, claims 1-69 will be in the application.

Attached hereto is a marked-up version of the amendments with deletions bracketed and additions underlined.

The Invention

The invention is directed to processes for imparting color to a bright metal surface by adhering a clear, tinted organic coating on the bright metal surface, e.g., chrome, nickel, nickel alloys, tin, tin alloys, and stainless steel. The clarity of the organic coating is an important characteristic of the invention, since a major objective is to provide a bright, lustrous metal surface with a decorative film coating that imparts a tint or color to the metal surface while allowing the brightness and luster of the metal surface to be seen through the clear tinted coating. It is also important to note that the claimed process utilizes an aqueous primer composition, which is much more environmentally friendly than known organic solvent based primer compositions.

Known techniques of applying polyurethane coatings to metal surfaces have been limited to application of protective coatings to aluminum, aluminum alloy, steel, iron, zinc and zinc alloys, not decorative clear, tinted coatings on bright metals such as chrome, nickel, nickel alloys, tin, tin alloys and stainless steel. These bright metal surfaces are inherently corrosion resistant and do not require a protective coating. This is why the prior art does not teach or suggest applying these known protective coatings to bright metals, such as chrome, nickel, nickel alloys, tin, tin alloys and stainless steel.

Applicant's motivation for coating chrome and other bright metal surfaces is to impart a color or tint to the surface without impairing or obscuring the beauty and luster of the bright metal surface. Prior attempts at imparting a color or tint to a bright metal surface without obscuring the beauty and luster of the bright metal surface have generally relied on electroplating or physical vapor deposition processes. These processes are unsatisfactory because of difficulties and high costs associated with them, and because of the limited range of

colors that can be achieved using these processes. Attempts at imparting a color or tint to a bright metal surface using a clear polymer coating have been unsuccessful because of the poor adhesion that is achieved between a bright metal surface and an organic polymer coating.

Known processes and polymer coatings used for protecting non-bright metals (e.g., aluminum, steel, iron and zinc) do not adhere as well to bright metals (e.g., chrome, nickel, nickel alloys, tin, tin alloys and stainless steel). In addition to the inherently high corrosion resistance of chromium and other bright metals (e.g., nickel, nickel alloys, tin, tin alloys and stainless steel), chromium and these other bright metals are generally less reactive than non-bright metals (e.g., aluminum, steel, iron and zinc), and known protective coatings that bond very well to these non-bright metals that are susceptible to corrosion do not bond well to chrome and other bright metals. This is well known to those skill in the art, and is the reason that the prior art does not teach or suggest the use of conventional protective coatings on chrome, nickel, nickel alloys, tin, tin alloys and stainless steel. Those having ordinary skill in the art would understand that a protective coating is not necessary, since the bright metals (chrome, nickel, nickel alloy, tin, tin alloy and stainless steel) are inherently corrosion resistant, and is undesirable, since the known protective coating compositions would obscure and impair the natural beauty and luster of the bright metal surface.

Applicant has discovered that excellent adhesion between a polyurethane coating and chrome or another bright metal surface can be achieved by using a primer composition containing an epoxy functional silane coupling agent and/or an aromatic amine functional silane coupling agent. This discovery has made it possible to tenaciously bond a clear, tinted polyurethane coating to a bright metal surface in order to impart a tint to the metal surface without impairing the lustrous appearance of the surface. This a significant advance in the art.

Prior Art Rejections

Claims 1-68 have been rejected under 35 U.S.C. §102(e) as being anticipated by Brown et al. (U.S. Patent No. 6, 071,566) or Wang et al. (U.S. Patent No. 6,048,579).

Neither the Brown et al. patent nor the Wang et al. patent teach or suggest a process for forming a polymer film on a chrome plate, or application of a coating composition or primer composition to a bright metal surface, wherein the coating or primer contains an epoxy functional silane compound or an aromatic amine silane compound.

The Brown et al. patent is directed to a method of treating a metal substrate to provide permanent corrosion resistance. The Brown et al. patent discloses that the corrosion resistant coating is applied to "steel; steel coated with a metal chosen from the group consisting of: zinc, zinc alloy, aluminum and aluminum alloy; iron; zinc and zinc alloys; and aluminum alloy." See column 2, line 61 through column 3, line 3. The Brown et al. patent does not teach or suggest applying the corrosion resistant protective coating to a bright metal, such as chrome, nickel, nickel alloys, tin, tin alloys, or stainless steel. Applicant has developed a process for applying a clear, tinted decorative polymer coating to a bright lustrous metal surface, whereas the Brown et al. patent describes development of a process for treating other types of metal surfaces to impart corrosion resistance. One having ordinary skill in the art would know that the Brown et al. patent is not teaching application of a primer composition or polymer coating composition to chrome or other bright metals (e.g., nickel, nickel alloys, tin, tin alloys and stainless steel). Thus, the Brown et al. patent does not anticipate the claims.

The Brown et al. patent teaches that it is essential to use a combination of vinyl silane compounds and multi-silyl-functional silanes. Suitable and preferred vinyl silane compounds and multi-silyl-functional-silanes are described at column 5, lines 6 through column 5, line 55 of the Brown et al. patent. None of the disclosed or suggested silane compounds are epoxy-functional silanes or aromatic amine functional silanes. One skilled in the art would understand that the claimed aromatic amine and epoxy functional silanes are

different from, and are not anticipated by the vinyl silanes and/or the multi-silyl compounds required by the Brown et al. patent.

Claims 1-12, 23-31, and 47-58 all require application of a primer composition and/or coating composition to a chrome surface. The remaining claims require application of a primer or coating composition to a bright metal surface, and/or an amine functional silane-coupling agent or an epoxy functional silane-coupling agent. The Brown et al. patent does not teach or suggest chrome or bright metal surfaces, and does not teach or suggest either an aromatic amine functional silane or an epoxy functional silane. Because the Brown et al. patent fails to teach or suggest the required chrome surfaces, and/or the required aromatic amine silane compounds or epoxy silane compounds, withdrawal of the rejection based on the Brown et al. patent is appropriate.

The Wang et al. patent is directed to a primer compositions that does not contain any silane adhesion promoters, and which is used for bonding elastomeric adhesives to "glass materials used in motor vehicle components such as windshields, side windows and back lights, with or without ceramic frit on the surface." The primer composition contains a silane-modified polyester polymer, a silane-modified multi-functional isocyanate, and a solvent. Rather than disclosing an aqueous primer composition, the primer compositions described by the Wang et al. patent are solvent-based primer compositions containing an organic solvent selected from acetone, methyl acetate, ethyl acetate and propyl acetate; and higher boiling point solvents such as toluene, xylene, or methyl propyl ketone (see column 7, lines 39-47).

The Wang et al. patent does not teach or suggest application of a primer composition to chrome plate. The Wang et al. patent does not teach or suggest an aqueous primer composition. Although the Wang et al. patent discloses a primer composition containing an adhesion promoter which is a silane-modified multi-functional isocyanate, the Wang et al. patent does not teach or suggest a primer composition containing a silane adhesion promoter. Silane adhesion promoters are compounds comprising a silicon atom typically having two or more hydrolyzable groups bonded to the silicon atom and one or two reactive organic moieties bonded to the silicon atom, and do not encompass silane-modified multi-functional isocyanates. Further, the Wang et al. patent does not teach or suggest primer compositions containing an

aromatic amine functional silane-coupling agent and/or an epoxy functional silane-coupling agent. Accordingly, the Wang et al. patent does not anticipate, or make obvious, any of the pending claims.

In view of the lack of any teaching or suggestion for coating of a chrome plate or other bright metal, or for a primer containing an aromatic amine functional silane-coupling agent or an epoxy functional silane-coupling agent, withdrawal of the rejection based on the Wang et al. patent is appropriate.

Claims 1-68 have also been rejected under 35 U.S.C. §102(b) as being anticipated by McGee (U.S. Patent No. 4,315,970), Ohtani et al. (U.S. Patent No. 4,542,070) or Chan (U.S. Patent No. 5,578,347).

The McGee patent is irrelevant to the claimed invention. McGee discloses "an improved method of adhering a thin metallic film or coating to a solid substrate." More specifically, the McGee patent is concerned with improving the adhesion of a thin metal coating to various substrates, such as plastics, wood, cardboard, glass, metals, silicone rubbers, urethane foams and polyvinylchloride foams (see column 4, lines 32-45). The processes described in the McGee patent involve treating a substrate with an organofunctional silane, drying the silane treated surface, and vapor depositing a metal on the silane treated surface. Physical vapor deposition of a metal on a substrate is significantly different from, and is not relevant to patentability of a process for adhering a polymer coating to a metal surface. The McGee patent does not teach or suggest application of a primer composition to a chrome or other bright metal surface, or application of a urethane coating composition over a chrome surface or other bright metal surface on which an aqueous primer composition has been applied and dried.

While the McGee patent discloses various silane adhesion promoters, the McGee patent does not teach or suggest use of an epoxy functional silane-coupling agent or an aromatic amine functional silane-coupling agent. Further, the Wang et al. patent does not suggest or provide motivation for the claimed processes of imparting color to chrome or other bright metals by tenaciously adhering a decorative polymer coating to the chrome or other bright metal surface using an aqueous primer composition containing silane adhesion promoters. The

methods of improving physical vapor deposition disclosed by the McGee patent are not relevant to polymer coating of metal surfaces. Accordingly, withdrawal of the rejection based on McGee is appropriate.

The Ohtani et al. patent discloses a process for adhering a polyurethane elastomer to a metal by coating the surface of the metal with a composition containing a polyepoxy compound and a polyamine compound. It is disclosed that improved adhesion may be achieved by adding a silane-coupling agent to the composition, with suitable silane-coupling agents including epoxy functional silane compounds. However, the Ohtani et al. patent only discloses solvent based primer compositions, not the required aqueous primer compositions, and only discloses protective coatings, not decorative coatings, applied to "iron, aluminum, copper, zinc or alloys containing these metals." See column 6, lines 44-46. The Ohtani et al. patent does not teach or suggest application of a decorative coating to a chrome or other bright metal surface, but instead teaches a protective (e.g., water resistant) coating for non-bright metals. Further, the Ohtani et al. patent only discloses solvent based primer compositions in which the adhesion promoters are dissolved in organic solvents such as "toluene, xylene, ethylbenzene, methyl ethyl ketone, methyl isobutyl ketone, methyl cellosolve, ethyl cellosolve, butyl cellosolve, an acetate ester of a cellosolve compound, etc." See column 3, lines 12-19. The Ohtani et al. patent only discloses the use of conventional epoxy-, thiol- and/or amino-functional silane compounds as adhesion promoters, and does not teach or suggest the use of an aromatic amine functional silane-coupling agent.

Because the Ohtani et al. reference does not mention application of a polyurethane on chrome or any other bright metal surface, and does not mention aromatic amine functional silane-coupling agents, the Ohtani et al. reference does not anticipate any of the claims. Further, the Ohtani et al. patent does not provide any motivation for applying a polyurethane coating to chrome or any other bright metal for decorative or any other purpose, and does not teach or suggest use of an aromatic amine functional silane-coupling agent for adhering a polyurethane coating to a substrate. Accordingly, withdrawal of the rejections based on the Ohtani et al. patent is appropriate.

The Chan patent discloses a method for finishing or coating a metal substrate by applying to a clean metal substrate a silane compound and subsequently applying a top coat of polyurethane, polyester, acrylic, alkyd or combinations thereof. However, the Chan patent only discloses adhering an organic coating to an aluminum or steel substrate, and does not teach or suggest adhering a polyurethane coating on a chrome or other bright metal surface. The Chan patent also does not teach or suggest use of an aromatic amine functional silane. Instead, only conventional epoxy functional and amine functional silanes are disclosed.

Because the Chan patent does not mention application of a polyurethane coating composition on a silane treated chrome surface or any other bright metal surface, and because the Chan patent does not mention use of an aromatic amine silane-coupling agent, the Chan patent does not anticipate any of the pending claims. The Chan patent only discloses finishing of an aluminum or steel substrate, and does not suggest imparting color to a chrome or other bright metal surface by coating the chrome or other bright metal surface with a polyurethane coating composition. Further, the Chan patent does not provide any other motivation for applying a polyurethane coating composition to a chrome or other bright metal surface. The Chan patent also fail, to mention use of an aromatic amine functional silane compound and fails to provide any motivation for using such compound for adhering a polyurethane polymer to chrome or other bright metal surface.

Therefore, the Chan patent does not anticipate any of the claims, and none of the claims would have been obvious to one having ordinary skill in the art based on the Chan patent. Accordingly, withdrawal of the rejection based on the Chan patent is appropriate.

Support For The Amendments

Support for the amendments can be found throughout the specification. For example, support for bright metal surfaces, selected from chrome, nickel, nickel alloys, tin, tin alloys, and stainless steel can be found at page 8, lines 19-22 of the specification.

Summary

Is it respectfully submitted that all of the pending claims are patentable over the prior art. In particular, none of the applied references teaches the required chrome, nickel, nickel

alloy, tin, tin alloy or stainless steel surfaces of the claims, and none of the applied references discloses the use of an aromatic amine silane adhesion promoter in a polyurethane coating composition or in a primer for attaching a polyurethane coating composition to a chrome or other bright metal surface. In the event that the Examiner does not withdraw the rejections, it is respectfully requested that the Examiner state exactly where it is in each of the references that a chrome surface or other bright metal (nickel, nickel alloy, tin, tin alloy or stainless steel) surface is described, and exactly where in each reference use of an aromatic amine functional silane compound is described.

New Claim

New claim 69 has been added to define a particular aspect of the invention. Support for new claim 69 can be found throughout the specification. For example, the concept of the invention is set forth at page 8, lines 9-18, with the particular bright metals listed at page 8, lines 19-22, and the specific steps set forth in original claim 1.

CONCLUSION

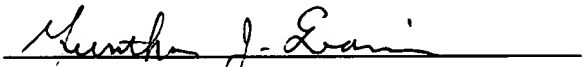
In view of the above amendments and remarks, it is respectfully submitted that the application is in condition for allowance and notice of the same is earnestly solicited.

Respectfully submitted,

QIHUA XU

By: Price, Heneveld, Cooper, DeWitt & Litton

January 13, 2003
Date



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 13, 32, 39 and 59 have been amended to read as follows:

13. (Amended) A process for forming a polymer film on a bright metal surface selected from chrome, nickel, nickel alloys, tin, tin alloys, and stainless steel, comprising:

applying an aqueous primer composition to the bright metal surface, the primer composition containing a silane adhesion promoter that is selected from the group consisting of aromatic amine functional silane-coupling agents and epoxy functional silane-coupling agents;

drying the applied primer composition;

applying a urethane composition over the metal surface on which the aqueous primer was applied and dried; and

curing the urethane composition to form a polyurethane film.

32. (Amended) An article comprising:

a bright metal substrate selected from chrome, nickel, nickel alloys, tin, tin alloys, and stainless steel;

a polyurethane film adhered to the metal substrate; and

a silane adhesion promoter enhancing adhesion between the polyurethane film and the metal substrate, the silane adhesion promoter selected from the group consisting of epoxy functional silane-coupling agents and aromatic amine functional silane-coupling agents.

39. (Amended) A two-component urethane composition comprising:

a polyol;

a polyisocyanate; and

a silane adhesion promoter [selected from the group consisting of epoxy functional silane-coupling agents and] that is an aromatic amine functional silane-coupling [agents] agent.

59. (Amended) A process of forming a polymer film on a bright metal surface selected from chrome, nickel, nickel alloys, tin, tin alloys, and stainless steel, comprising:

applying a urethane composition to the metal surface, the urethane composition containing a silane adhesion promoter that is selected from the group consisting of aromatic amine functional silane-coupling agents and epoxy functional silane-coupling agents; and

curing the urethane composition to form a polyurethane film.